Production of Poultry Feed From Domestic Animal Blood

A. B. M. Wahid Murad¹, Md. Zubayer Abdul Bari², Fatema-Tuj-Zohra³

Department of Applied Chemistry and Chemical Engineering²,³

Institute of Leather Engineering and Technology, University of Dhaka, Bangladesh¹

University of Dhaka, Bangladesh²,³

Abstract:
Blood meal contain valuable protein source. In our country a lot of cattle are slaughtered in the slaughter house, in maximum cases this blood is discharged in the sewer. Thus, a valuable protein source is lost if animal blood is discarded as waste and this is compounded by the resulting serious environmental pollution problems. In this investigation raw blood was collected and the protein was extracted from it to produce a blood meal for poultry feed. It will be highly beneficial for poultry sector and environment if the blood is used, processed and utilized industrially. A further incentive is the increased profits to be made through adding value to the blood besides saving large scale of pollution.

Keywords: Blood, Protein, Centrifugation, Sterilization, Coagulant, BOD.

I. INTRODUCTION

Blood is a rich source of iron and proteins of high nutritional and functional quality. Blood is sometimes referred to as liquid protein as it contains high protein generally about 18% [5, 7]. Every day in our country lots of cattle are slaughtered in the slaughter house and other area. However, the blood is discharged in the drain or in canal or river causing pollution to the environment and annihilated valuable protein. Production of blood meal for poultry feed from animal blood is beneficial for both the mankind and environment. As blood contains high protein, its BOD value is high. Blood itself has a high BOD: 150,000-200,000 mg/L, the extreme value being 405,000 mg/L [8]. This discharged blood polluted both the ground and surface water at a great extend. Hundreds of millions of animals are slaughtered each year all over the world, and most of these are slaughtered for meat production. The full potential value of the large amounts of blood produced during the slaughtering has not been realized yet. After it has been converted to blood meal, some of this blood is used to produce plasma proteins, animal feed supplement and fertilizer. Much blood, however, is not used in a productive manner and ends up being discarded with attendant environmental consequences. In this study, the possibility and production of blood meal for poultry feed from domestic animal blood was investigated.

II. LITERATURE REVIEW

Ofori, J.A. and Hsieh, Y.-H. P. in Florida State University, Florida U.S.A , Department of Nutrition , Food Exercise Science both they worked The Use of Blood and Derived Product as Food Additives. They have been analyzed where blood can be used as a human food in Meat and Non-meat industry [6]. Johannes Everse, Ph.D., Texas Tech University Health Sciences Center and Gwynne H. Little, Ph.D., an Associate Professor of Biochemistry at the same institution. Both applicants are thoroughly familiar with proteins, their properties, separation techniques, oxidation products, etc. as well as with the scientific literature pertaining to this notice. Their substance pertains consists of whole animal blood from which the colored component (the heme), as well as all non-protein components, have been removed using an oxidative process. It thus consists of naturally occurring blood constituents (proteins), although some of the amino acid residues in some of the proteins may have become oxidized during the process [1]. R. Gatnau, J. Polo and E. Robert APC EUROPE, Tarragona 161, 12, 08014 Barcelona, Spain was done a research on Plasma protein antimicrobial substitution at negligible risk. Anna Castelló (1), Olga Francino (1), Betlem Cabrera (1), Javier Polo (2), Armand Sánchez (1) (1) Servei Veterinari de Genètica Molecular. Facultat de Veterinària, Universitat Autonoma de Barcelona, E-08193 Bellaterra (Spain). E-mail: Anna.Castello@uab.es (2) R&D Department. APC EUROPE SA. Avda. Sant Julià 246-258. Pol. Ind. El Congost. E-08400 Granollers (Spain). They worked on Identification of bovine material in porcine spray-dried blood derivatives using the Polymerase Chain Reaction Technique [3].

III. MATERIALS AND METHODS

Raw materials collection:
The total weight of blood from the domestic animals is equivalent to 6 to 7% of the lean meat in the carcass, whereas the whole quantity never completely recovered from the animal body [4, 9]. The greatest care must be taken to ensure that the blood is undiluted with water as this means more moisture to remove higher costs and long time of processing. Speed of collection in processing is important, as any delay causes the blood to decompose, a process accompanied by evil smells. Blood meal produced from decomposed blood has a low protein contain and is unpalatable to livestock [4]. In this process Heparin is used as an anticoagulant. Heparin acts as an anticoagulant, preventing the formation of clots and extension of existing clots with in the blood. It was originally isolated from canine liver cells, hence its name (hepar or "ήπαρ" is Greek for "liver") [2].
Firstly heparin is taken in the pot where the blood is collected by an injection syringe. Then the blood is collected in the pot. There is no exact volume that will be needed. But in this process 0.5 ml has been used for 500 ml of whole blood.

**Centrifugation:**
Centrifugation is an important operation to separate the blood cell from plasma. Blood consists of 60% plasma and 40% cells in volume. Cells are heavier than plasma thus they tend in a dish centrifuge to stay down whereas plasma goes to the top of the centrifuge.

![Figure.1. 3D shapes of heparin](image1.png)

Firstly the blood with anticoagulant is taken in different test tube and then put into the test tube hole of machine with proper adjustment. Then the machine is started and run at 3000 rev/min with the time 15 minutes. Within it has been seen that the blood has been separated with two layers, plasma and the blood cells which is settled down at the bottom. The blood cell is then collected from plasma. In this process initially taken 500 ml of whole and its yields 280 ml of blood cell after centrifugation.

![Figure.3. Blood after Centrifugation](image2.png)

**Drying:**
After centrifugation the blood cell has been dried to remove moisture. In here the blood is heated on water bath. The blood is taken in beaker and then heated upon water bath. Initially 78 % moisture has been removed by this normal process. But it is recommended that the 10 % is allowed otherwise the micro organism decompose the protein. Then the sample is taken in to a vacuum drying oven to removal maximum level moisture. The sample is dried at 50°C at 0.6 Mpa pressure and it has been taken 3 hrs to reduce the resultant moisture. The final moisture was 10.17%.

**Milling:**
Although some manufacturers of stock feed will purchase unmilled blood meal, a better price and standard product will be obtained by milling it. However, as the blood contaminates every implement used for milling, it is preferable to build a small ball mill.

**Sterilization:**
As blood is protein, it does contain high microbial load. Generally it has been found 1,350,000 bacterial counts initially. So it is need to reduce the microbial load for the purpose of use as poultry feed by sterilization. There are lots of methods of sterilization but in here gamma radiation is used. Because none other method is as suitable as gamma radiation. The most popular method sterilization auto-clave cannot be used in this process, because the auto-clave increases the final moisture which is not desirable.

**Methodology at a glance:**

```
Raw material collection
  From slaughter house
  Use of anticoagulant
    Heparin is used as an anti coagulant
    Centrifugation
      3000 rev/min, at 15 min.
      Drying
        Normal drying on water bath
        Vacuum drying at 50°C
        Radiation
          Gamma radiation is used

IV. RESULTS AND DISCUSSION

Moisture Analysis:
In this process by normal drying in water bath
Initial moisture =28.78%
After vacuum drying in vacuum drying oven for 3 hrs at 50°C, 0.06 Mpa Final moisture= 10.17%
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**Microbial count:** As it contains high protein lots of microorganism are survival here. So it needs the microbial count of the final product.

![Initial microbial count](image1)

![Microbial count at 2.5 KGY](image2)

**Figure.4. Initial microbial count**

**Figure.5. Microbial count at 2.5 KGY**

Initial,
Total bacterial count (TBC) = 5.0×10^8 cfu/g
After radiation,

<table>
<thead>
<tr>
<th>Radiation (KGY)</th>
<th>TBC (cfu/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>2×10^7</td>
</tr>
<tr>
<td>5</td>
<td>Nil</td>
</tr>
</tbody>
</table>

**Quantitative compositions:**
The product is a mixture of all the proteins contained in blood. A complete catalog of these proteins is impractical (probably even impossible with current technology). Globulin derived from hemoglobin is the major component accounting for about 70% of the total. Albumin accounts for about 10% of the total, with the remainder being made up of small amounts of hundreds of other proteins. It should be noted that some of these proteins contain amino acid residues that are oxidized as a result of the decolorization process. Thus, some of the cysteine residues have been oxidized to cystic acid residues and some of the methionine residues are oxidized to methionine sulfoxide. The higher oxidation product, methionine sulfone, is not formed during the oxidation process and is not present in the final product.

**Biological oxygen demand (BOD):**
The BOD value of the final product was found 1600 mg/l which was comparatively much lower than the BOD value 150,000-200000 mg/l of raw blood.

**Physical properties:**
Color of the product: Dark brown
Odor: Odorless
Physical State: Aggregate form

**Chemical properties:**
**Solubility**
Water: Not soluble in water
Acid: Not soluble in acid (H_2SO_4, HCl, and HNO_3 & mixed acid)
Alkali: Not soluble in NaOH

**Oxidation**
The sample is aggregated in the presence of air. A small amount of sample is exposed in the air 5 hrs. It has been seen that the sample is going to be black and hard aggregate formed which is not desirable.

**Total estimated protein:**
Blood meal contains mostly protein (about 80-85 % DM) and small amounts of fat (< 1% DM) and ash (< 5% DM), though non-industrial blood meals may include other materials and thus be richer in ash. Unlike other animal protein sources, blood meal has a poor amino acid balance. Its lysine content is relatively high (7-10 % DM) which makes it an excellent supplemental protein source to use with plant-derived feed ingredients that are low in lysine. However, its isoleucine content is very low (about 1 % DM), so diets for monogastric animals must be formulated to contain enough isoleucine for the level of performance desired. Pepsin digestibility has been shown to be a good test for assessing the availability of the protein fraction of blood meal. Blood meal is rich in iron (more than 1500 mg/kg DM). As blood is a protein obviously the final product dried blood meal contain up to 80% protein.

**Weight of the Sample:**
Initially 500 ml raw blood sample has been taken. After complete removal of moisture it yields 200 ml blood meal.

**Food value:**
The product contain the following food ingredients-
Cost Analysis:
The product can be produced with low cost because the raw material is available and is very cheap. In any production raw material availability is a main fact. In this production there is no problem with that. Spray drying is recommended in this process. In bulk production it will be benefited. There is no problem with radiation, because it is cost effective. So the product can be applied industrially.

Suggestions:
Few suggestions is given below to avoid difficulties-
- Agitates the blood container so that whole bloods will not colts.
- If drying instrument is unavailable then preserve the blood in low temperature, otherwise it will decompose.
- Radiation process is best for sterilizing the final product because in autoclave the moisture will increase after sterilization which may cause further bacterial attack.

V. CONCLUSION:
As this blood meal contains 85% protein it can be applied in the poultry feed. This high protein will enrich the food value of the poultry food ingredient. Generally protein helps to increase the growth of any types of living thing. Blood meal contains high protein. If blood meal is applied in the poultry as poultry feed, it will get valuable and rich calories. So that it will be beneficial for the investor as well as our environment. Furthermore, this product can also be applied in he-chary as a fish feed cause this protein also valuable for fish growth. But there need some more experiment and with concern other parameters. Blood meal can be processed industrially and applied in the poultry feed. Thus a valuable protein source will utilize and poultry owners will also benefited.

VI. REFERENCES: